Great Lakes Student Activity Book

I. Introduction

The Great Lakes were carved out of the earth by glaciers during the last ice age - about 20,000 years ago. They have a tremendous impact on many people's lives and health. The Great Lakes ecosystem is constantly exposed to new imbalances imposed by humans. The lakes serve as transportation for ship and barge traffic. The ships and barges often carry animals and plants from other places into the lakes. Many cities and farms border the lakes. Fertilizers and weed killers get into the lakes by running off from these farms and cities. The water quality of the lakes is directly affected by human activities. Because the lakes are so large, they have a significant impact on local weather.

Get Info Objectives

- 1. Name the Great Lakes.
- 2. Determine the distance from student's residence to the Great Lakes.
- 3. Define "alien" (introduced) species.

Gather Data Objectives

- 1. Interpret color coded maps of Great Lakes data.
- 2. Graph monthly rainfall data obtained from a chart.
- 3. Determine the effects that imported species have on native animal and plant populations.

Application Objectives

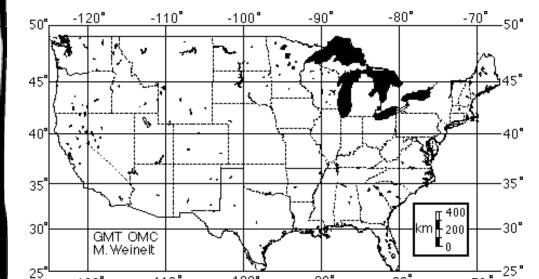
- 1. Determine the relationship between the length of time wind has blown over water and the height of waves.
- 2. Write a paragraph describing Zebra mussels' economic influences.
- 3. Determine steps necessary to ensure the recovery of the Great Lakes' ecosystems.
- From the main screen, click "Get Info".

II. Get Info

A. Names

-120°

1. Label the six Great Lakes in the picture below.



- Click on the Names site to check your answers.

-100°

-110°

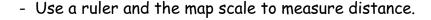
- Click "Back" in the top bar of your web browser until you get back to the OAR Great Lakes Get Info site.



-90°

-80

B. Location



- 1. Draw a straight line from your city to the intersection (meeting place) of lakes Superior, Michigan, and Huron.
- About how many kilometers are the Great Lakes from your house?
- 3. How far from you are the Great Lakes in miles? One mile = 1.6 km.

C. Alien Introductions

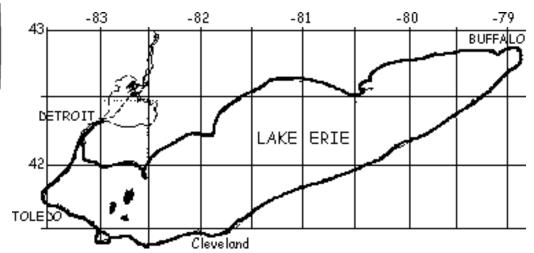
- Click on the "Foreign Species" site.
- Scroll down to the "Species Introductions" section.
- Read the section and answer the following questions.
- What do you think an "alien" or "foreign" species is?

2. What are some beneficial (helpful) effects on an area when an animal or plant from another area is introduced?



	3. What are some harmful effects on an area when an animal or plant from another area is introduced?
	
% %	- Click "Back" until you get back to the OAR Great Lakes main screen.
24	- Click "Gather Data".
1100	III.Gather Data
	A. Wind Speed on Lake Erie
参	- Click on the "Wind Speed" site.
	 Predict which areas of Lake Erie will have the highest waves. Record your answer as a written description of the location relative to other parts of the lake.
	

2. Draw the area of highest waves on the map of Lake Erie.



3. Why do you think these areas will have the highest waves?

4. Convert the highest wind speed from knots to miles per hour. (One knot is 1.15 miles per hour.)



- Click "Back" until you get back to the OAR Great Lakes Gather Data site.

B. Wave Height on Lake Erie





- Click on the "Wave Height" site.

1. Check your prediction in #1 above. Was your prediction correct?

2. How many feet high are the highest waves on Lake Erie? (one foot = 12 inches, one meter = 100 cm, one inch = 2.54 cm)



- Click "Back" until you get back to the OAR Great Lakes Gather Data site.

C. Water Elevation



- Click on the "Water Elevation" site.
- This map uses elevation like a topographic map. Elevation means height above sea level. Higher elevations are higher above sea level.
- 1. What part of Lake Erie has the highest water elevation?



2. What part of Lake Erie has the lowest water elevation?

3. What is the direction of water flow in Lake Erie?

from the _____ to the _____.

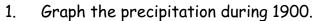
4. What is the total difference in water elevation from the northeast end of Lake Erie to the southwest end?

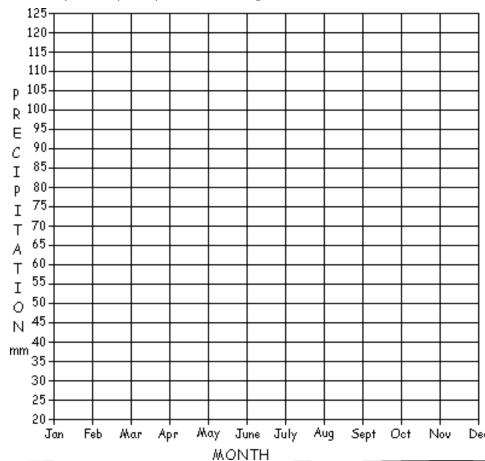
____meters

- Click "Back" until you get back to the OAR Great Lakes Gather Data site.
- Click "Forward" at the bottom of the screen.

D. Graphing Overland Precipitation

- Click on the "Lake Erie Precipitation" site.











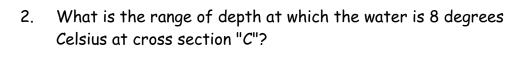
- Click "Back" until you get back to the OAR Great Lakes Gather Data site.

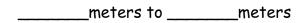
E. Temperature Changes with Depth



- Click on the "Lake Ontario Vertical Temperature" site.
- This map shows you the water temperature at various depths of Lake Ontario. The picture in the right lower corner shows the whole lake with lines drawn where the four cross sections are taken.









F. Effects of Foreign Species on Local Animals



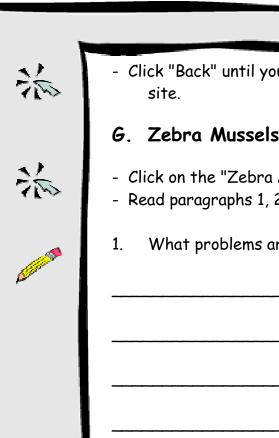
参

- Click on the "Health Indicator" site.
- Read the site and answer the following questions.
- 1. How is the "health" of Lake Michigan's water life populations measured?

2. Why does the lack of amphipods affect the fish population?



4.	Why do you think the amphipods are disappearing?
- 0	Click on the "amphipods" hot text in the site.
	Scroll down to the blue and white maps of the <u>Diporeia</u> popula Lake Michigan.
5.	When you compare the maps from different years, what coinfer (figure out) about amphipods' population?
6.	Why is it important to measure <u>seemingly</u> unimportant thin such as the number of invertebrates in the mud at the bot
	lakes?
7.	How do scientists make maps like these?



- Click "Back" until you get back to the OAR Great Lakes Gather Data

G. Zebra Mussels - A Closer Look

- Click on the "Zebra Mussel" site.
- Read paragraphs 1, 2 and 4 of the "Impacts" section.
- What problems are caused by Zebra Mussels?
- What good things have happened due to Zebra mussels? 2.
- Read the "Methods of Control" section.
- List the three methods of control you think are best. Write why 3. you think these are the best methods.

Method	Why it is good	
a		
b		
c		







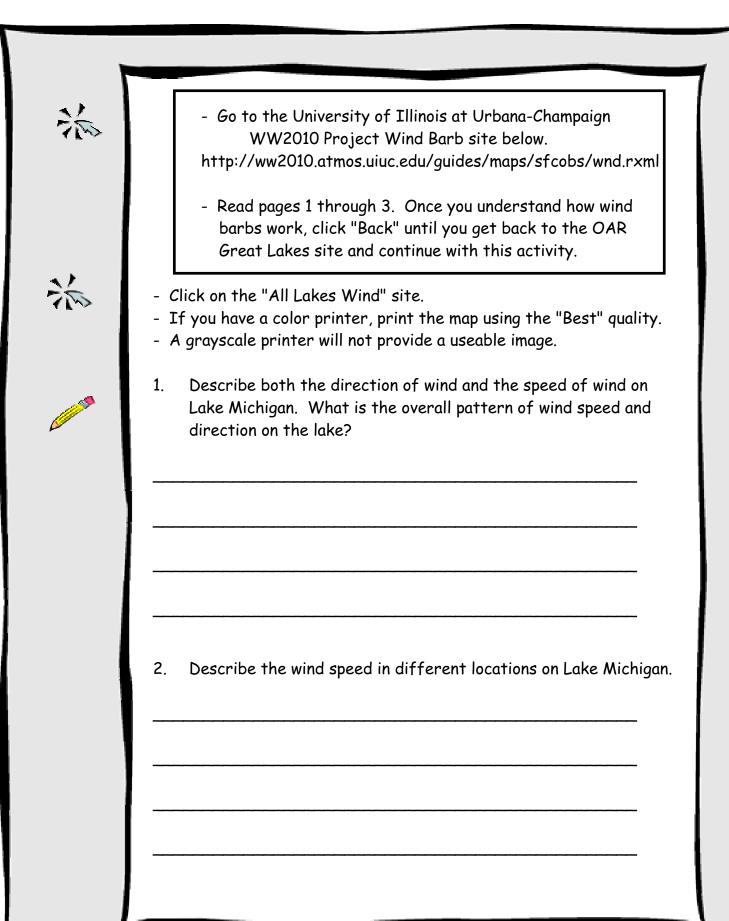


- Click "Back" until you get back to the OAR Great Lakes Gather Data site.
- Click on the "Zebra Mussels Biofouling" site to see examples of Zebra mussels biofouling and living on other mussels. This picture show how zebra mussels can block water pipes.
- Click the "Next slide" button. This picture shows how zebra mussels live on and kill native mussels.
- Click "Back" until you get back to the OAR Great Lakes main screen.
- Click "Application".

IV. Application

A. Wind Duration vs. Wave Height

- If you have done the Forecasting activity, skip the boxed wind barb section below.





- Click "Back" until you get back to the OAR Great Lakes Application site.
- Click on the "All Lakes Wave Height" site.
- If you have a color printer, print the map using the "Best" quality.
- A grayscale printer will not provide a usable image.
- If you don't have a color printer, enter the following URL. ftp://superior.eng.ohio-state.edu/pub/ncaster/allakes/97/ w9711212.gif
- Click the "Back" and "Forward" buttons on the web browser to move between the pictures if you want to.

3.	Describe the wave height in different parts of Lake Michigan. What is the overall pattern of wave height?
	

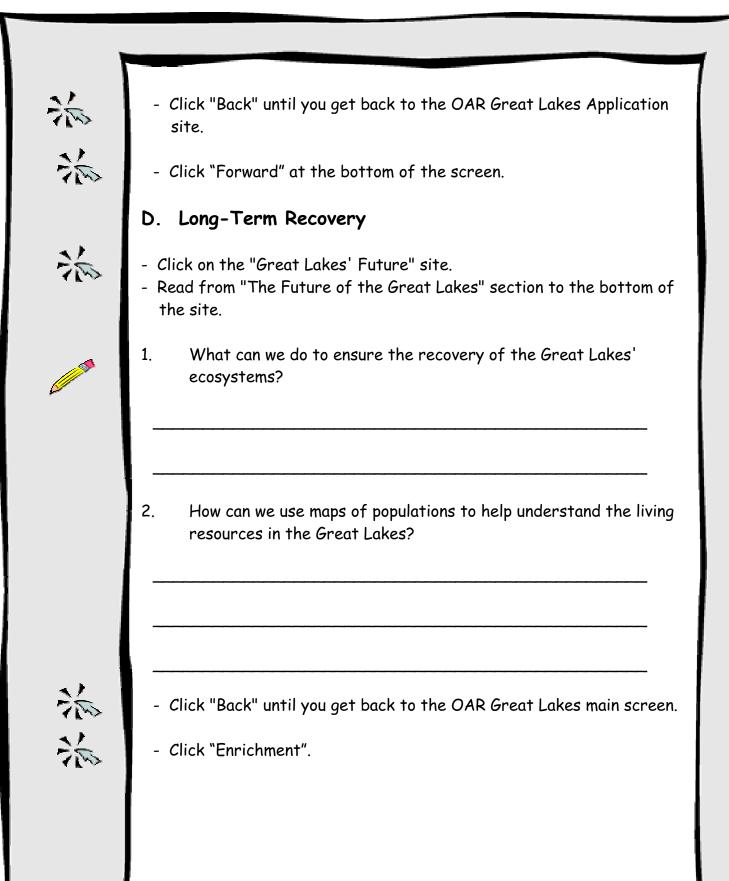
What is the relationship between the length of time the wind blows over water and the height of the waves produced?

参 - Click "Back" until you get back to the OAR Great Lakes Application site.



	B. Economic Impacts
	Think about the harmful and beneficial effects of Zebra mussels. What are some ways Zebra mussels are economically important? ———————————————————————————————————
禁	 Click "Forward" at the bottom of the screen. C. Progress
	The Great Lakes border not only the US, but also Canada. The water quality of the lakes affects both countries. We have to work together to provide a future for the lakes and the people who live on them. Both countries signed an agreement called "The Great Lakes Water Quality Agreement" that has helped us clean up the lakes. The Canadians have designed a site called the Great Lakes Atlas that has lots of useful and interesting information on the lakes. You can find the URL in the Related Web Sites section at the end of the activity. This section uses parts of their Great Lakes Information Management Resource site.
然	- Click on the "State of the Lakes" site.
710	1. Overall, which lake had the highest concentration of phosphorus in 1991/92?

2.	Which lake had the highest concentration of PCB's in fish?
	Lake had a PCB concentration of ppm.
3.	Which lake had the highest concentration of PCB's in gull eggs?
	Lake had a PCB concentration of ppm.
4.	Which lake had the second highest concentration of PCB's in gull eggs?
	Lake had a PCB concentration of ppm.
5.	Compare the small inset map in the upper right corner to the larger map. Which areas show the greatest improvement between 1983 and 1991?
6.	What does the graph of the PCB concentration at Mugg's Island show is happening over time?
7.	What do you think caused the trend in question 4 above?



V. Enrichment Activities

A. Interviews

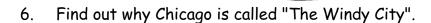
- 1. Interview a meteorologist about the specific weather conditions that are caused by the Great Lakes, especially in winter.
- 2. Talk with someone who has gone ice fishing and ask about what is caught, when is the best time to go, and what is used for bait.

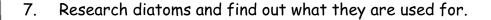
B. Newspaper Activities

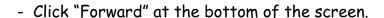
- 1. Using the weather section or map, keep a record of the daily temperatures or snowfall at cities around the Great Lakes vs. cities inland. What is the difference between inland and coastal cities' temperatures and rainfall?
- 2. Collect news articles related to the health of the Great Lakes and summarize each article.

C. Research

- 1. Write a short report on how the Great Lakes formed. Include when they were formed, how they were formed, how long it took, and a diagram of what happened.
- 2. Find out who was the first European to see the Great Lakes.
- 3. Using a map, list all the major cities and their populations that border the Great Lakes. Add the total population of the cities.
- 4. Research Native American tribes that lived in the Great Lakes area.
- 5. Find out what industries are supported by the Great Lakes.







D. Related Web Sites

- Great Lakes' Effects on Weather http://covis.atmos.uiuc.edu/guide/rsteve/html/snglband.html
- 2. Great Lakes Environmental Research Laboratories http://www.glerl.noaa.gov
- Great Lakes Atlas Tons of info and great pictures
 http://www.cciw.ca/glimr/data/great-lakes-atlas/intro.html
- Great Lakes Phosphorus and PCB concentrations map http://www.cciw.ca/glimr/data/great-lakes-atlas/ images/gig13.gif
- Native American tribal information http://cciw.ca/glimr/data/great-lakes-atlas/glatchap3.html#1
- 6. Exotic Species in the Great Lakes Regions http://great-lakes.net/envt/exotic/exotic.html
- 7. Amphipod Decline Page (435K PDF file) http://glerl.noaa.gov/pubs/brochures/dipo.pdf



